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A SYNOPSIS OF CURRENT AND PLANNED COAL TRANSPORTATION INITIATIVES

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A SYNOPSIS OF CURRENT AND PLANNED COAL TRANSPORTATION INITIATIVES

by

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ABSTRACT

Canada is a major producer and exporter of bulk mineral commodities. The delivered value of these products invariably includes a significant charge for transportation. As mineral markets become more competitive producers are intensifying their efforts to reduce the cost of their products and transportation is considered to offer some potential. Transportation is particularly important in determining the value of coal and is a special focus of attention in the initiative to establish a market for low-sulphur western Canadian coal in Ontario.

This report highlights existing and planned initiatives in transportation with a view to determining where further research effort might be focussed. Some thirteen organizations are identified as having an interest and supporting technical work that could have an impact. A considerable amount of work is underway and at this point no particular opportunities for further work have been firmly identified.

The report is intended to help focus thinking with a view to canvassing the views of the Coal Subcommittee, Minister's National Advisory Council to CANMET.

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SYNOPSIS DES INITIATIVES ACTUELLES ET PREVUES EN MATIERE DE TRANSPORT DU CHARBON

par

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RESUME

Le Canada est un grand producteur et exportateur de produits minéraux en vrac. La valeur livrée de ces produits comprend invariablement d'importants frais de transport. Comme les marchés des minéraux deviennent de plus en plus concurrenciels, les producteurs intensifient leurs efforts pour diminuer le coût de leurs produits, notamment les frais de transport qui semblent compressibles. La part du transport dans le prix du charbon est déterminante, et c'est sur cet aspect qu'il faut se pencher pour établir un marché ontarien pour le charbon à faible teneur en soufre de l'Ouest canadien.

Le présent rapport souligne les initiatives actuelles et prévues en matière de transport en mettant l'accent sur le bien-fondé d'efforts de recherche supplémentaires. On y identifie quelque treize organismes intéressés qui sont engagés dans des travaux techniques qui pourraient avoir un impact. Un nombre considérable de travaux sont en cours et, jusqu'à ce jour, aucune avenue particulière n'a été nettement identifiée pour des travaux à venir.

Le rapport vise à préparer le terrain en vue de sonder l'opinion du Sous-comit du charbon du Conseil consultatif national du Ministre auprès de CANMET.

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INTRODUCTION

Canada produces many bulk commodities including coal, potash sulphur, iron ore and base metal concentrates. In most cases these minerals are transported thousands of kilometers to market. Unprocessed and processed minerals account for about half of all domestic rail traffic and one third of all domestic marine shipping.

This report summarizes existing and planned initiatives that could contribute to reduced transportation costs of coal and coal products. The descriptions include the name and address of a contact person who can provide additional details on particular projects.

Although focussed on coal because coal transportation costs often exceed minesite costs, these initiatives are not necessarily commodity specific.

EXISTING AND PLANNED INITIATIVES

The synopsis does not include past initiatives such as the numerous studies on coal slurry conducted from the early 1970's to the mid-1980's. Mine site and preparation/upgrading technologies are also specifically excluded as are regulatory and policy issues.

1. Canadian National

In addition to efforts to reduce variable and fixed costs (such as wage rates, crew sizes, cabooses, operating rules, redundant rail lines, facilities and the like), Canadian National is involved in a number of R and D efforts including:

a) The design of a high efficiency coal car.

b) The Hump Yard Improvement Project to increase efficiency of train assembly and car distribution operations at all major terminals.

c) The Operations Management Centre project to improve utilization of motive power and rolling stock and assist in expediting train movements.

d) The introduction of innovative wayside inspection systems to improve train inspection and scheduled maintenance of rolling stock.

e) Several traffic management projects to enhance handling of bulk commodity and carload traffic.
f) A locomotive mounted rail lubrication system that could if introduced reduce fuel consumption by an estimated 5 to 7 percent.
g) A program intended to improve rail resistance to wear and fatigue thereby reducing rail replacement requirements.

For further information on these subjects please contact:

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2. CP Rail

In the past, CP Rail has been instrumental in developing the bath-tub gondola car which increased coal car payload from 73 to 95 tonnes and integrating their unit train system with the mines and Westshore Terminals. A single unit train on the 2300 kilometer southeast British Columbia to Westshore Terminals route can now haul a million tonnes per annum. Current R and D efforts include:

a) The development of a second generation unit train to improve safety, reliability and productivity. Slackless drawbars and multiple distributed remote locomotives would be used.
b) Improved wheel life, reduced rail wear and fuel savings are expected from radial steering - assist hardware for car trucks.
c) The retro fitting of locomotives with positive traction control which could reduce the number of locomotives on a unit coal train from five to four.
d) The Locomotive Maintenance Information System and Car Maintenance Information System together with consolidation of preventative maintenance at the purpose-built Golden (British Columbia) maintenance shop is expected to increase equipment availability and reliability.

e) The service testing of AC traction technology over the past two years has demonstrated the impressive performance of that technology. Locomotive manufacturers are designing AC traction prototypes which should be available in a few years.

For further information on these subjects contact:

Denis Apedale
Assistant Vice President
Government and Industry Affairs
CP Rail
Montreal, Quebec
(514) 395-6871

3. Action Committee on Western Canadian Low-Sulphur Coal to Ontario

The Action Committee created an intergovernmental secretariat which presented its report on November 19, 1987. Specific recommendations subsequently endorsed by the Action Committee in the area of transportation improvements included:

a) The identification and quantification of major overhead burdens to Canadian coal movements by rail and a comparison of those with U.S. railroads (lead role: Federal Government).

b) The determination of Thunder Bay and Duluth Terminal Operations throughput changes for increased volumes, storage and boat lengths; the technical and economic viability of blending at Thunder Bay; and the evaluation of competition for terminal access from other bulk commodities (lead role: Province of Ontario).

c) The estimation of economies of scale for laker transportation associated with higher volumes, dedicated service, larger vessels and backhauls (lead role: Province of Ontario).

d) An examination of whether Alberta and British Columbia coal could be competitively delivered to Ontario via the Panama Canal (subsequently cancelled).

e) The evaluation of feasibility and demonstration of preparation, long distance transportation and separation of oil agglomerated coal as a coal-oil slurry in existing pipelines (lead role: Province of Alberta).

For further information on these subjects contact the agency identified with the lead role or:

Garnet T. Page, O.C.
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4. Transport Canada

The Transportation Development Centre of Transport Canada in Montreal is active in a number of areas including cooperative cost shared research with both Canadian National and CP Rail. Current projects include:

a) A cooperative program with CP Rail that has examined various radial truck technologies and is examining in service performance of a unit coal train (200,000 kilometers of service to date) fully equipped with two different radial truck assemblies.

b) A cooperative program with BC Rail, CP Rail, National Research Council and Reid, Crowther and Partners to develop rail grinding approaches and profiles to reduce rail corrugation, shelling and side wear and thereby extend rail life in curves and decrease wheel wear and fuel consumption.

c) A cooperative program with Canadian National and CP rail to investigate an automated field system using acoustic methods with intensity analysis to detect railway truck wheel defects at speeds up to 25 kilometers per hour.

d) In cooperation with CP Rail, the development of a laser vision system to scan transverse rail head profile on a track geometry car for high speed rail inspection.

e) Evaluation of the propensity of various experimental and commercial steels to produce contact fatigue cracks in combination with lubricants with a view to development of contact fatigue resistant rail steels.

f) Review of current problems identified by five western Canadian coal producers, state-of-the art and technological R&D applicable to rail transportation of coal in western Canada.

g) Projects now under consideration include the development and testing of an aluminum coal car, assessment of the aerodynamic benefit of using covered coal cars, and a re-examination of the integral train concept.

For further informatioan on these subjects contact:

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(514) 283-0066

5. Mandrell Industries

Mandrell Industries of Saskatoon is investigating the feasibility of a high speed gas turbine AC drive locomotive fuelled by natural gas. It has been estimated that operating cost would be one-third of current generation diesel locomotives.

For further information contact:

W.E.B. (Blue) Taylor
Vice President Mandrell Industries
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Saskatoon, SASK
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6. Alberta Economic Development and Trade

On behalf of the Transportation Service Branch, National Steel Car Limited of Hamilton has designed a high efficiency unit train coal car that could improve net train load by more than 38 percent over present coal trains without exceeding dimensional or load limitations.

For further information contact:

Victor G. Hamm
Alberta Economic Development and Trade
Transportation Services Branch
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T5K 2P6
(403) 427-4611

7. Alberta Energy

On behalf of the Alberta Office of Coal Research and Technology (AOCRT), Trimac Consulting of Calgary has developed a simulation model of a Canadian coal supply and transportation system that can examine various alternatives and scenarios and estimate delivered cost to potential coal consumers.

For further information contact:

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or

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General Manager
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P.O. Box 3500
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(403) 298-5100

8. Salzgitter "DENSECOAL" Technology

Under the umbrella of the Canada/Federal Republic of Germany Bi-lateral Science and Technology Agreement, FRG, Canada, Alberta, and private sector participants are investigating the technical and economic feasibility of manufacturing, transporting by pipeline, and burning a

coal-water slurry fuel made from Alberta coal by the "DENSECOAL" process. Pipeline transport will be analyzed using the specifications of two existing oil pipelines running from Alberta to a utility in Ontario and the port of Vancouver.

For further information contact:

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9. Saskatchewan Potash

Saskatchewan potash producers, like western Canadian coal producers, are concerned about transportation because shipping costs represent half the value of their product and transportation can result in degradation of product quality.

On behalf of the Saskatchewan Potash Producers Association (SPPA), Sparks and Associates of Saskatoon are undertaking a review of transportation/distribution problems as perceived by industry and their customers. The program will identify and priorize individual problems, potential solutions and develop terms of reference for high priority areas.

For further information contract:

D. Boyle
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10. EMR/CANMET - Coal Research Laboratories

CANMET maintains a continuing, industry-responsive program of research on coal preparation, some of which impacts directly on coal transportation e.g. process development to remove ash and moisture from a variety of coals, spontaneous combustion, dust suppression, slurry rheology, coal upgrading etc. Specialized expertise is available and projects are initiated in response to perceived industry needs and the recommendations of the Ministers National Advisory Council to CANMET.

For further information contact:

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CANMET, Coal Research Laboratories
Energy Mines and Resources Canada
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11. ENVIRONMENT CANADA

Studies of coal dust associated with rail transportation have been made by Environment Canada and the province of British Columbia. Environment Canada published in 1986 the report "Coal Dust Control - Recommended practices for loading, unloading and transporting coal by rail". One of the shortcomings of previous studies is the lack of an analytical method for the determination of coal particles in a particulate matrix containing other carbonaceous material. A co-operative project has been initiated to develop an analytic method using a pyrolytic gas chromatograph.

For further information contact:

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Environmental Protection, Pacific Region
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12. NATIONAL RESEARCH COUNCIL

The National Research Council (NRC) working with industry, university and government agencies, is organizing its research activities in support of transportation technology to form a national R&D program in transportation. In addition to transportation a similar program is being implemented for the resource industry by NRC.

The main objectives of the program are: to develop and apply technologies for reducing the costs of transportation; to increase the competitiveness of Canadian manufacturers of transportation equipment; to develop and apply technologies for improving transportation safety; and to ensure the efficient use of transportation R&D resources in Canada.

Under the program, NRC will encourage participation in its projects with researchers from industry, universities, provincial research organizations and other government agencies. Joint projects within the program will often include access to NRC's unique national facilities for testing, model validation and prototype design.

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Division of Mechanical Engineering
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(613) 993-3974

13. AMERICAN ASSOCIATION OF RAILROADS - RESEARCH AND TEST (R&T) DEPARTMENT

A comprehensive program of research is carried out to make the member railways more productive. In 1985 total direct, contract and complimentary funding was $40.8 million and the personnel complement was 372. Canadian railways are members and some of the work already identified in this report under railways makes up part of this program. In addition, some of the programmed work is carried out in the National Research Council laboratories in Canada. A few projects of interest are:

a) High Productivity Integral Train (HPIT). The goal of the project is to reduce the costs of unit train service in intermodal and bulk commodity (particularly coal) markets. It is anticipated that integral trains could reduce operating costs by as much as 50% in intermodal service and 35% in bulk service. Nine design concepts were received and plans were developed to test prototypes of those concepts that passed the review process.

b) Advanced Train Control Systems (ATCS). The project was initiated by the Railway Association of Canada with the conviction that better train control systems could be developed using modern telecommunications and microprocessor technology. Specifications are being developed to permit suppliers to develop compatible modules to suit individual railways needs.

c) Train resistance is being studied from the perspective of rail lubrication and aerodynamic drag. It has been shown that at approximately 60 mph the total train resistance is about the same for loaded and empty gondolas. Aerodynamics was the principal cause of resistance for speeds above 35 mph.

The Association has a great number of research projects underway of practical interest to railway operators, e.g. energy efficiency and alternatives, vehicle/track interaction, safety, productivity, etc. They are not reviewed here. It is of interest to note that the Association has had a three fold increase in its budget in the period 1977 to 1985 and this is attributed in part at least to deregulation. It is claimed that there is a much more positive attitude to the adoption of new technology in a deregulated environment.

CONCLUDING STATEMENT

The initiatives listed here already represent a substantial R&D effort and the list could no doubt be extended. The projects will achieve some reduction in cost of transportation. The extent to which these savings are cumulative, transferrable to coal producers or impact the bus bar cost of electricity are unclear. Nevertheless, transportation often represents half the value of delivered coal and as such is a major factor governing the competitiveness of the industry. At the very least more information on transportation research may be needed.

Transportation, like most traditional industries, is currently undergoing fundamental re-structuring. Technological advancements, shifting markets and a changing regulatory outlook will no doubt lead to many changes. Whether such changes will be progressive depends to a large extent on how they integrate into the existing transportation network. The transportation industry, physically and institutionally is large, firmly established and highly integrated.

One gradually emerging perspective is that the existing coal transportation system, based essentially on rail haulage, is a good one and research to improve it further is in place and effective. Incremental improvements will continue but it is unlikely that incremental efficiency gains in rail systems will produce the magnitude of delivered cost reduction (up to $20/tonne) needed to make western Canadian coal attractive in the Ontario market.

Two pipeline initiatives (Action Committee on Western Canadian Low Sulphur Coal to Ontario coal-oil slurry and Salzgitter "DENSECOAL" coal-water slurry) are included in this report. In the Canadian context, pipelines are possibly the only viable alternative to rail haulage. The Alberta Energy sponsored Trimac study is worthwhile extending to consider the viability of such pipelining options to selected destinations.

Not surprisingly the western Canadian coal industry is frustrated. They have increased mine site productivity by +60% this decade and are now facing further errosion in their competitive position from the escalating Canadian dollar.

In the past year, both EMR-CANMET and Transport Canada have met with transportation specialists employed by the western Canadian coal industry. In both cases, those meetings did not identify areas of obvious R&D needs save for nagging minor problems like rail car freezing and unreliable unit train arrival times at the mine load-out facilities.

There are no obvious solutions to the problem of high coal transportation costs and there are a number of concerned stakeholders. This report is intended to help focus thinking on critical issues. We would welcome your views on specific R&D that might be undertaken.